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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003900473 for a patent by NORMAN LESLIE MATTHEWS as filed on 04 February 2003.

WITNESS my hand this
Seventeenth day of February 2004

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Improved Engine (No.5)

This invention relates to improvements to internal combustion engines and more particularly improvements to circular (toroidal) piston cylinder type internal combustion engines.
This invention may also adapt for use as an improved external steam engine pump, combustion motor compressor of the hydraulic type or air or other gas type, motor or engine.
This invention may provide an engine or motor of any type such as stationary or vehicle engines or pumps or motors and may also adapt for use as an electricity generator or hybrid vehicle second motor or engine preferably electricity generating or use motor with the internal combustion engine.

Background:

The most common type engine known is the reciprocating piston engine where up and down movement pistons driven by fuel ignition power engine.
Other type engines known are rotary or orbital motion engines, where the piston is a rotor in a chamber that rotates by fuel burning on one side at a time and to a combustion sequence to drive the engine. One other type of rotary engine has pistons or vanes in a circular cylinder that are connected to a central drive shaft by a rotating disc, and that by burning fuel between at least two piston parts drives the engine.
One particular engine of this type has a circular cylinder, in an annular and toroidal form with pistons attached to two rotors. The rotors (2) locate and exit the circular cylinder by a slot around and at its centre that connects to two drive shafts that turns at varying speeds to cause a piston stroke and combustion cycle and combustion (fuel burning), that drives the engine..

Introducing the Invention:

This present invention aims to provide such an engine as above, later described that is improved by having only one rotor or none at all, that has improved piston action and engine operation, aiming to provide a more fuel efficient or overall improved circular annular cylinder (toroidal) type engine or engines, or in an alternative embodiment the invention provides conventional pistons, with piston rings con rods and a crankshaft, and pistons cylinder that are provided to a rotating movement on the engines axis center engine block or cylinder housing (the block movement providing the power).
This present invention aims to provide an improved engine by in one example providing that the piston or pistons on or in the engine circular cylinder have a reciprocating motion mechanism that provides to at least one piston variable speed acceleration and deceleration motion. Such motion directly related to the engine's rotation speed and acceleration changes, and by which is obtained an ignition and combustion cycle and combustion chamber that can drive the engine.
The invention provides in one embodiment that the piston or pistons referred to above are able to move in a manner that is independent in one aspect to the movement of the rotor or rotors. Rotors that is as may be used to drive an output shaft to drive the engine. The piston or pistons arranged on an independent movement permitting connecting arm (or connecting rod). The arm located on the rotor or rotors or to the cylinder, and connected to a further mechanism to create said arm independent movement. A control of said movement of said arm mechanism that has one part connected to the outside of the cylinder and is remote from the rotor, though it may be adjacent to the rotor and cylinder.
This present invention is now disclosed and described by way of one example only in the following statements wherein.

According to one preferred embodiment of the present invention an engine is provided having at least one circular (toroidal) or annular cylinder, and at least one piston into the cylinder and adapted to move rotating in one direction preferably in the said cylinder and the said piston connected by various means to an engine drive shaft or gear mechanism or any other similar mechanism, and from rotation of which the engines power is able to be used.

Preferably the cylinder has an inner side, an outer side, and a first and a second side on the outside and has a central side surrounded by the cylinder.

Preferably the cylinder is spaced apart from the said centre drive shaft in the centre side of the engine, and end plates connect the said sides first and second to said shaft.

Preferably the engine has provided ignition and fuel and air for the combustion process means added effective in the cylinder and that may be of any current type and suitable to "fire" and drive the piston and the invention is able to use fuel of any type.

Preferably the said circular cylinder has a slot shaped aperture around its central side, the side of the cylinder facing the centre and drive shaft.

Preferably a shaft connects to a disc like rotor that extends from the shaft into the said cylinder via the said slot aperture in the cylinder. Preferably in one embodiment at least one piston is attached to said rotor.

Preferably the piston is attached to the said rotor on the rotor edge periphery edge inside the cylinder and said rotor periphery edge is shaped to match and complete the circle-curve cross section of the said circular cylinder.

Preferably said piston is adapted to be attached to said rotor in a manner that enables the piston to move in effect back and forth on the rotor even while the rotor is spinning. Such movement is of a limited distance reciprocatingly or in effect reciprocating. The movement provided so that the piston can create a stroke and assist to create a combustion chamber and cycle.

Preferably the said piston obtains said movement on the rotor by being attached to the rotor on above said arm or (a connecting arm or rod or plate mechanism). Preferably the connection of the arm to the rotor in one example is with the arm's first end fixed close to the rotor centre, thereby creating and allowing the arm's backwards and forward movement to be pivotal from the rotor centre, thereby the pistons movement in the cylinder on the arm in the rotor is upon the same radius as the cylinder radius.

Preferably the arm is located in an aperture in the rotor, such aperture having a first and second side and a first and second end, each preferably parallel to each other and again slot like in design, so that the rotor has a continuous surface on either side to enable it to rotate within the cylinder slot, and to which sides of the rotor seals or bearings can be fitted or engaged upon.

Preferably the piston is elongated in shape and is of adequate or extra length than otherwise would be needed so that the said aperture for the arm in the rotor is covered by the said elongated piston. The said piston having at least one sealing or piston ring or set at one end, preferably the front piston end that same end is the preferred combustion chamber end.

Preferably the piston is caused to move back and forward in said aperture in said rotor by a mechanism that has a first part on the rotor and a second part away from the rotor. (i.e. the second part is on the outside of the cylinder in a particular location).

Preferably said second part mechanism is a gear (ring or star), and preferably the first part is a wheel or planetary gear. Preferably the planetary gear connects with a crank lever action to the aforesaid mechanism arm of the piston.

Preferably the planetary gear is fixed to the rotor in a precise position by a shaft, and is supported to the shaft on bearings about which the gear can rotate, the gear meshed with the said first part ring or star gear stationary fixed to the engine, thereby when the engine is turned

or turns the planetary gear moves rotationally with the rotor and revolves by its connection to the outside gear, thereby causing the crank lever to move back and forward and consequently to move the piston backwards and forward.

Preferably thereby when the rotor is caused to turn (by such as an engine starting starter motor the planetary gear is caused to turn (on an axis of its connection to the rotor) and by being connected via its teeth to the gear on the engine, and by turning the planetary gear moves an attached crank shaft like lever connected to said piston arm and thereby moves the said arm and piston back and forth, the rotor is prevented from kicking back at the time of ignition by the placement of said lever to said arm, and on said gears, and by the provision of gears, one of which is connected to the outside and is stationary and by the planetary gear turning rotationally on its shaft on the rotor in a direction that transfers any piston backward pressure or motion via the outside gear to forward rotation of the rotor.

Preferably the said arm and said piston moves rotationally with the rotor and moves said independently in a relative back and forth direction manner.

Preferably the said cylinder has a second piston similar to the first, located inside said cylinder and that piston connects, is fixed to the said same single rotor as is the first piston. The said second piston can be attached rigidly to said rotor or said second piston can be attached in the same way and with the same independent movement back and forth and by the same said similar gear and crank mechanism as is the method of fixing the said first piston.

The said second piston is located on one side of the said first piston and in one aspect acts to provide a second side to the combustion chamber and in a second aspect is provided to be the mechanism that turns the rotor by the pressure from fuel burning and drives the engine.

Preferably the said second piston is provided to the front side of the first piston, the first side of the combustion chamber and the two pistons work as a pair to cycle and drive the rotor and thereby to drive the engine.

Preferably the second piston connection to the rotor and to the outside of the engine mechanism is arranged so that when fuel is ignited (burnt) in the combustion chamber or space between said pistons the pressure in the backwards direction from such combustion does not significantly if at all effect the forward travel of the second piston and the rotor, because the crank shaft type connection via a gear and the gear turns freely on a bearing on the rotor and moves in the right manner so that this does not occur, as aforesaid above, assisted by the second piston being moveable independently, thereby allowing greater freedom and distance of adjustment to obtain combustion when the pistons come together, and without loss through kick-back travel or pressure, the second piston independent travel adjusted with relation to the first piston's independent travel to obtain the best movement and effect in this respect.

The first piston so arranged provides a first and one side to the combustion chamber, and by its independent movement acts in a manner similar to the head of an engine side of the combustion chamber of a conventional and reciprocating piston kind engine.

Preferably the invention provides that the first piston is caused to decelerate in its speed at the time of initial and continuing combustion stroke, with respect to the acceleration or speed of the second piston and of the rotor's rotation and is able to do so by its said connection via a crank shaft or lever to the revolving planetary gear location on the side of centre of the gear that causes the lever to move in the opposite direction to the rotor (by gear use), and can apply a force to turn the rotor via its connection to the stationary ring or star gear outside.

Preferably a suitable fly wheel and or counter balance mechanism is added to the engine. Alternatively the said rotor is used.

In one embodiment the gears are replaced with tooth belts and pulleys.

Preferably the engine has a firing cycle that is sequential, and the timing firing cycle can be as a two stroke or four or any other stroke cycle engine.

Preferably end covers, plate like are provided over the outside ends to the cylinder shaft and gears, and provide the support for bearings and seals for the said drive shaft.

The engine, the invention, is now described with reference to one example operation of the above said mechanisms.

The engine is started by a conventional means such as a starter motor, the starter motor turning a fly wheel or the rotor, the first piston moves away from the second piston by its deceleration and sucks in or allows clean combustion air in, fuel is introduced and said first piston returns moving forward by accelerating in speed to the back end and combustion chamber end of the said second piston, and compresses the air and fuel and a spark or flame is provided that ignites the fuel. The combustion pressure then causes the rotor to accelerate driven by the second piston attached and thereby turns the drive shaft (or other means), and thereby drives the engine.

At the same time that this is occurring, the second piston is moving forward inside the said circular cylinder (rotating with the rotor), whilst the first piston is decelerating again and moving, in effect backwards.

This first piston movement and second piston movement and phase can be called the power stroke of the pistons to afore cycle ignition process. and engine power.

When the first piston reaches the end of this backward direction (in effect) movement the gear mechanism and crank lever causes it to accelerate and to return to the close proximity to the back of the second piston and in doing so enables it to push out spent air and fuel (exhaust gas). The gas preferably exits the cylinder via a port or valve (the is available through the cylinder at the precise and that location). In the instance that the engine's firing is twp stroke cycle, fresh air is introduced ahead of the returning piston.

The engine continues to operate with the first piston caused to move away, backward from the second piston back end and in so doing so repeats the cycle.

When the engine is of the two cycle firing stroke the air in flow and exhaust gas outflow is arranged in a system similar to normal engine two stroke cycle, except that the invention features improvements thereto because the piston or pistons travel rotationally and in one direction.

The invention provides that where required for added power or balance more than one pair of pistons are provided, for each one circular cylinder.

Preferably the aperture in the rotor for the piston arm can be used to drain lubricating oil or excess or left over combustion gas, or as a path to allow air in or exhaust gas out (from or into the cylinder).

Preferably the present invention features, that when compared to present known type circular (toroidal) cylinder engines, the cylinder is oversize. The cylinders overall diameter is oversize with relationship to the size of the piston used diameter so that the engine power is itself oversized (excessive power). The increase in cylinder overall diameter and relevant to piston diameter size provides the maximum and higher torque to the drive shaft from the piston from fuel burning than is otherwise possible with present known art engines.

For one example of the above oversize feature the said cylinder for an average use such as a medium size car is of approximately one metre overall or outside cylinder diameter, whilst the said cylinder's inside diameter and piston diameter are approximately only 100mm. In such an engine having oversize cylinder to piston size enables a larger number of pistons to be used (because of the extra circumference and size of the cylinder

In said oversize engine feature greater inner side (central location) useable for engine parts space is provided.

This invention may have more than one cylinder on the same shaft than the single one described above, and where required the diameter size can be of a minimum to better reduce

the engine space needed.

In one preferred embodiment of this present invention where the engine has more than one set of pairs of pistons per one per single cylinder and rotor, the firing sequence is sequential (ie one piston set firing at a time. The sequence can be like a clock in a circle around the cylinder, one, two and three and so on for example, or alternating from one side of the cylinder to a second, but still only one piston firing at one time.

For example if two pairs only are use the pistons firing is one and then the second. If 3 sets, of pistons are used the firing order is one, two and three. If four pistons, one, two three and four and so on. Whilst number 2 piston can be on the opposite side to the cylinder to the number one piston and so on.

The engine can have in fact any of the above firing cycles or any other due to and because of the piston or pistons having said independent movement.

In one preferred and alternative embodiment of the present invention a crank action mechanism i.e. a crank shaft, or scotch yoke is provided, located inside the cylinder itself, together with a connecting rod to the piston, and with a shaft through an aperture in the cylinder and to the outside of the cylinder.

In one embodiment in place of a reciprocating movement arm to a first or second piston, located to and through a rotating rotor, there is provided a rotating shaft turned by gears located at either end, and of any type when the engine turns, and the turn crank shaft or scotch yoke or other similar mechanism inside the cylinder preferably to one side of a piston, and thereby by this arrangement the need for elongated slot in the rotor for a reciprocating shaft is overcome.

In one embodiment of the last paragraph the piston may locate over the crank shaft or scotch yoke and have its connection thereto such as a connecting rod to the inside of the piston also, and inside the sealing rings at either end.

Preferably in this alternative embodiment or variation embodiment as per the last paragraph above, the first piston is caused to move via said crank mechanism inside the said cylinder located on the back end of said first piston, preferably having the crank arm inside the back end of the said first piston to minimize the space taken, the mechanism providing the same operation as aforesaid when the crank is outside of the cylinder.

.In this embodiment the shaft extends out from the cylinder via a bearing and seals as needed, and inlet air may be ducted in via the shaft to the piston region, the shaft being deliberately oversize as needed if used as an air path. The piston may also have ports or valves to allow such air to be introduced into the combustion chamber. Such ports or valves may be controlled by the rotation of the crank shaft or and or by the piston's reciprocating movement within the cylinder. In this embodiment the cylinder itself rotates and the rotor and slot aperture in the cylinder are eliminated. The cylinder is mounted on the drive shaft via such as a centre portion to the cylinder inner side to the position of the drive shaft, and the cylinder is located within a stationary engine housing, such housing having bearing and seals to support said drive shaft.

The above alternative embodiment features the shaft to the crank inside the cylinder being connected on the outside to a drive mechanism to cause it to rotate, such as a gear, a planetary gear or gear wheel like gear, that in turn connects to a matching tooth gear, a ring or star gear, that is stationary and located on the said housing. The operation of the piston is therefore the same as above described.

The present invention in any one of the above described embodiments or examples features having a shaft from the cylinder to the region of the centre location drive shaft, this said shaft preferably has such as a gear on a first end adjacent to the drive shaft, and such gear is connected to a second gear that rotates on the drive shaft and is fixed to the drive shaft when

the drive shaft is turned, thereby causing said shaft to turn, and said shaft at its second end the end inside the said cylinder then turns a crank action mechanism connected to aforesaid first pistons. Said shaft may be provided inside an embodiment using a rotor that rotates and extends into the cylinder, or the aforesaid alternative embodiment where the cylinder itself rotates and the rotor is eliminated.

In one embodiment counterweights arranged to move reciprocatingly when the engine is started, one for each piston at least to balance the engine rotating cylinder block or housing or rotor to overcome out of balance as the piston weight moves from one point on the rotating path of the engine to a second. Alternatively on such as a 3 piston number engine each piston fires at the same time.

In one embodiment, chains and chain sprockets are used in place of gears and for the connection of the crankshaft ends (to the outside world of the engine) In one embodiment the engine is made of a piston cylinder block and or housing main and rotating component, the engine then has two internally levcled out type halves hat go over and around the above said cylinder block and has locating space and precision fitting design for the crankshaft and con rod and crankshaft bearings (on each side) and that join together to complete the piston sump and connection to the crank engine block (but stationary component of the engine).

In one embodiment and by way of example, current engines such as self contained and operating chainsaw 2 stroke engines are provided clamped between two sides and new components and connected to at least one gear or chain at the crankshaft end and may be sealed or open construction and use when open air moves by the rotation to cool. The engine in this embodiment has air in and exhaust out as is convenient but preferably via a central and hollow shaft and cooling air or water pumped or sucked into a space around the engines and fuel etc provided so that the same conventional engines deliver more power by turning the engine block of which they are part.

In one form the invention provides a mechanism comprised of at least one complete operating engine preferably 2 stroke that is attached (as a couple off the shelf unit actually) to the mechanism and turns rotating that mechanism by cylinder movement from reaction to push via piston and crank of gears or such like on stationary part or housing.

The invention featuring greater efficiency from the same engine by changing the work capture from the crankshaft to the cylinder via said mechanism.

In this embodiment preferably multiples of engines are used and circular or counter balance weights when only one engine is used.

The invention may use a chain and sprocket in place of gears and the engine may have 2 stroke operation of fuel and air but separate lubrication the air flow made possible by the availability of a space (manifold on one side of the engine and the air therein being of above atmospheric pressure. The added pressure coming from the bottom of piston pumping or by an outside of the engine blower or fan!)

In the embodiment of the invention where a rotating rotor inside one side of a circular cylinder is used the moveable piston is replaced with a semi circular ball like mechanism that moves rotating on a shaft. The said ball adapted to match a curve in a fixed piston on either side in the cylinder, and by its shape wherein at least one section of one side is more or less flat, the ball can create a firing cycle and stroke and one side to a combustion chamber, in a manner that replaces the first piston behind a second piston.

In one variation of the invention the piston and crank mechanism referred to of the first and independently moving piston is replaced with a rotary action piston inside the cylinder, matched and together with a change in the design (shape) of the particular portion of the cylinder, where the rotary piston is located and used. The rotary piston in this invention, however is adapted to transmit the combustion of fuel energy to the rotating cylinder via a

fixed engine head like portion or back of a second piston. The rotary action is by its shaft being conventional and connected via a said first gear, connected to the said second gear.
In this embodiment the said rotor features being shaped suitable to provide the required and above described firing cycle, and combustion chamber one side, and is not required to itself drive the engine. Adjacent said rotor is a fixed head like forming across the cylinder that is driven by the ignition of fuel pressure, such head portion may be of a particular shape to match the requirements of a rotating rotary piston as above described, used therein.
Note: A normal type engine has the pistons moving up and down and connected to the drive shaft and that only 25% for example approximately efficient primarily because the head portion of the combustion chamber and half is fixed. Excessive heat and therefore energy is lost as is well known due to this arrangement, whilst the circulating circular engine has the head moving and does so in a continuous action moving in one direction, and aims to have 100% or the best possible torque efficiency and mechanical leverage connection angle to the drive shaft..
The moving engine head portion and cylinder or piston on the rotor its mass is small and conventional engine reciprocating piston action is improved upon or overcome. In one or more of the above embodiments the result of this engine is a smaller loss of energy.
Variations may be made to this invention without departing from the principles thereof.

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